**3GPP TSG-RAN4 Meeting #112 *R4-241xxxx***

**Maastricht, The Netherlands, 19 – 23 August, 2024**

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| *CR-Form-v12.3* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  | **38.133** | **CR** | 4859 | **rev** | 1 | **Current version:** | **18.6.0** |  |
|  | | | | | | | | |
| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* | | | | | | | | |
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| ***Proposed change affects:*** | UICC apps |  | ME | **x** | Radio Access Network |  | Core Network |  |

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| ***Title:*** | CR on requirements for satellite switch with re-sync | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Huawei, HiSilicon | | | | | | | | | |
| ***Source to TSG:*** | R4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_NTN\_enh-Core | | | | |  | ***Date:*** | | | 2024-08-05 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | F |  | | | | | ***Release:*** | | | Rel-18 |
|  | *Use one of the following categories:* ***F*** *(correction)* ***A*** *(mirror corresponding to a change in an earlier release)* ***B*** *(addition of feature),* ***C*** *(functional modification of feature)* ***D*** *(editorial modification)*  Detailed explanations of the above categories can be found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | | | | | | | | *Use one of the following releases: Rel-8 (Release 8) Rel-9 (Release 9) Rel-10 (Release 10) Rel-11 (Release 11) … Rel-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)  Rel-20 (Release 20)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | The ending point of the delay or interruption requirements for satellite switch is the UL transmission in the new satellite. However, based on RAN2 procedure, UE is not expected to transmit UL after the satellite switch. | | | | | | | | |
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| ***Summary of change:*** | | Clarify that the ending point of satellite switch with re-sync is the time point when UE is ready to receive DL channels/signals or transmit UL channels/signals from/to the target satellite. Also, remove TIU in the delay/interruption time. Sub-clause 6.1C.3.2.1 is voided because it does not define additional requirements compared to 6.1C.3.2.2 or 6.1C.3.2.3. | | | | | | | | |
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| ***Consequences if not approved:*** | | Requirements for satellite switch with re-sync are incorrect. | | | | | | | | |
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| ***Clauses affected:*** | | 6.1C.3.2 | | | | | | | | |
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|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **x** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | |  | **x** | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | |  | **x** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

<Start of Change 1>

6.1C.3.2 NR SAN FR1 – NR SAN FR1 Satellite switching with re-synchronization

The requirements in this clause are applicable to both hard and soft switch over quasi-earth fixed scenario from NR SAN FR1 cell to NR SAN FR1 cell. The requirements in this clause apply provided that UE has the valid and applicable parameters of ephemeris information, common TA, DL and UL Polarization information, Koffset, and Kmac for target NR SAN cell during Dswitch\_unchangedPCI, otherwise interruption time may be longer than the requirements in clause 6.1C.3.2.2 for hard satellite switch and satellite switch delay may be longer than the requirements in clause 6.1C.3.2.3 for soft satellite switch.

Requirements for soft satellite switching are applicable for UEs that support *softSatelliteSwitchResyncNTN-r18* [14]when network configures soft satellite switching with resynchronization [2].

Requirements for hard satellite switching are applicable for UEs that support *hardSatelliteSwitchResyncNTN-r18* or *softSatelliteSwitchResyncNTN-r18* [14] when the network configures hard satellite switching with resynchronization [2]; or for UEs that support *hardSatelliteSwitchResyncNTN*-r18 but do not support *softSatelliteSwitchResyncNTN-r18* when the network configures soft satellite switching with resynchronization.

6.1C.3.2.1 Satellite switching delay

When the UE receives a broadcast message implying satellite switching within re-synchronization, the UE shall be ready to start the transmission of the new uplink PRACH channel or transmission of the new uplink PUSCHchannel within Dswitch\_unchangedPCI msec.

Where:

- Dswitch\_unchangedPCI equals to the interruption time stated in clause 6.1C.3.2.2 for hard satellite switch and satellite switch delay stated in clause 6.1C.3.2.3 for soft satellite switch.

6.1C.3.2.2 Interruption time for hard satellite switch with re-sync

The interruption time is the time between *t-service* and the time when the UE is ready to receive any DL channel/signal and transmit any UL channel/signal from/to the target satellite if the UE only supports the feature for hard satellite switch or network only configures hard satellite switching with resynchronization.

When intra-frequency hard switch to NR SAN cell is commanded,

the interruption time shall be less than Tinterrupt

Tinterrupt = Tsearch + Tprocessing + T∆ + Tmargin ms

Otherwise, no interruption time requirement is applied.

Where:

- Tsearch is the time required to search the target NR SAN cell assuming the target cell is not already known when UE starts synchronizing with target satellite. If the target cell Es/Iot ≥ -2 dB, then Tsearch = [Tfirst\_SSB] ms. Regardless of whether DRX is in use by the UE, Tsearch shall still be based on non-DRX target cell search times.

- T∆ is same as the one defined in section 6.1C.1.2.2.1.

- Tprocessing is time for UE processing. Tprocessing can be up to 10 ms.

- Tmargin is time for SSB post-processing. Tmargin can be up to 2ms.

- Tfirst\_SSB is the time to the end of the first complete SSB burst of target satellite, the location of which is determined by the periodicity and location of SSB of the source satellite, the ssb-TimeOffset and the difference between propagation delay of the serving satellite and the target satellite counted from the [SSB-TimeOffset reference point as defined in 38.331 [2]] to UE.

UE is allowed to skip measurements for other cells and satellites than the target satellite and source satellite from *T-service* until the satellite switch completion.

6.1C.3.2.3 Satellite switch delay for soft satellite switch with re-sync

The Satellite switch delay is from *t-serviceStart* to the time instance when UE is ready to receive any DL channel/signal and transmit any UL channel/signal from/to the target satellite, if the UE supports the feature for soft satellite switch and network configures soft satellite switching with resynchronization.

When intra-frequency soft switch to NR SAN cell is commanded,

the satellite switch time shall be less than Tsoft\_switch

Tsoft\_switch = max(*t-service*-*t-seviceStart*, Tsearch + T∆ + Tmargin) + Tprocessing ms

Where:

- Tsearch is the time required to search the target NR SAN cell assuming the target cell is not already known when the handover command is received by the UE. If the target cell Es/Iot ≥ -2 dB, then Tsearch = Tfirst\_SSB ms. Regardless of whether DRX is in use by the UE, Tsearch shall still be based on non-DRX target cell search times.

- T∆ is same as the one defined in section 6.1C.2.2.2.1.

- Tprocessing is time for UE processing. Tprocessing can be up to 10 ms.

- Tmargin is same as the one defined in section 6.1C.2.2.2.1.

- Tfirst\_SSB is is the time to the end of the first complete SSB burst of target satellite, the location of which is determined by the periodicity and location of SSB of the source satellite, the ssb-TimeOffset and the difference between propagation delay of the serving satellite and the target satellite counted from [SSB-TimeOffset reference point as defined in 38.331 [2]] to UE.

During the time period from *t-seviceStart* to *t-service*, scheduling restriction as defined in clause 9.2C.5.3 is allowed, with the exception that the locations of SSB symbols of target satellite where scheduling restriction applies are determined by the periodicity and location of SSB of the source satellite, the ssb-TimeOffset and the difference between propagation delay of the serving satellite and the target satellite counted from the [SSB-TimeOffset reference point as defined in 38.331 [2]] to UE.

UE is allowed to skip measurements for other cells and satellites than the target satellite and source satellite from *t-seviceStart* to the satellite switch completion.

The requirement in this clause applies and UE is required to keep the connection (DL and UL) with the source NGSO satellite, under the following conditions:

- SSBs from the two satellites are spaced apart from each other at least by 1 OFDM symbol in the time domain at UE Rx side.

<End of Change 1>